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version of fundamental relations in the larva is well illustrated in the development of the middle ear and sound-transmitting apparatus where my personal interest has centered.

Thus the embryologist in attempting to explain development encounters illustrations of the formation of apparently non-adaptative structures and structures whose adaptative value has apparently been lost. The idea of adaptation must be ever present with him and yet he must avoid the assumption of a "function" for all things, or seek "fitness" as the key to the interpretation of structure. The field or work for him is first of all the analysis of the underlying developmental processes in which adaptation is portrayed. There are, however, always the two aspects, pattern and texture, in life activities.

Illustrations of apparently non-adaptative structures which apparently never are or were adaptative will doubtless occur to you, many of them correlated with sex; others apparently useless and seemingly a pure exuberance of growth and behavior. These I can not discuss; they lie outside my field. They emphasize again that the secret for them as for adaptation lies wrapped up in the complexity of life processes with the obscure and prolonged evolutionary history involved, and our only hope lies in analysis.

B. F. KINGSBURY

THE FINAL EXAMINATION OF SENIORS IN AMERICAN COLLEGES

WHETHER seniors at the end of their college course should be required to take examinations at the same time as other students, or several days or weeks earlier, or whether they should be excused from examinations altogether upon the basis of their term standing, is a problem which is not infrequently up for discussion. While one may hardly hope to settle the matter absolutely, to know the practice in different institutions throughout the country may not be without value.

Early in May, 1912, I sent out a postal questionnaire to all the institutions listed under the head of "Universities, colleges and technological schools for men and for both sexes" in the Report of the Commissioner of

Education for 1909, which was the latest volume accessible to me at that time. There were but two questions asked, viz., "Do the seniors in the collegiate department of your institution take their final examinations in the spring term, or second semester, at the same time as, or two or three weeks earlier than, the rest of the students?" "Are some of the seniors excused from the final examination upon the basis of their high average, 85 per cent., 90 per cent., 95 per cent., during the spring term, or second semester?" Of the 493 institutions to which postals were sent, 347 replied, and those replies throw at least some light upon the problem.

The simplest method of dealing with this material is to take the undifferentiated list of institutions in its entirety. Of the total number, 493, 70 per cent., were heard from. Of these, 167 require the seniors to take their final examinations at the same time that the rest of the students do, while 154 set the senior examinations at an earlier date. There were, also, 26 replies which were not definite. This majority of 13, while not great, becomes more significant when one considers the variety which prevails among the other institutions. The date for these earlier examinations varies from two or three days before the regular examinations to seven or eight weeks. The tendency, however, is to have them scheduled one or two weeks earlier, as is shown by 68 and 46 postals, respectively.

The following tables are in the main self-explanatory.

TABLE I
*Institutions at which Final Examinations for
Seniors are Scheduled Earlier than for
Underclassmen*

Two or three days earlier.....	3	Two or three weeks earlier.....	19
Five days earlier.....	1	Three weeks earlier..	8
Ten days earlier.....	3	Three or four weeks earlier.....	1
One week earlier.....	68	Four weeks earlier...	1
One or two weeks earlier.....	2	Seven or eight weeks earlier.....	1
Two weeks earlier.....	46	Scattering ¹	1
Total.....	123	Total.....	31

¹ This term designates a card which indicated that some of the examinations are earlier, but did not specify definitely.

TABLE II
*Distribution of the Institutions of Table I.
according to the Census Divisions*

North Atlantic.....	31	South Central.....	13
South Atlantic.....	28	Western.....	13
North Central.....	69	Total.....	154

TABLE III
*Distribution of all the Institutions to which
the Questionnaire was sent*

North Atlantic.....	91	South Central.....	77
South Atlantic.....	82	Western.....	46
North Central.....	197	Total.....	493

TABLE IV
*Number of Institutions Heard from in each
Division*

North Atlantic.....	72	South Central.....	38
South Atlantic.....	51	Western.....	35
North Central.....	151	Total.....	347 ²

TABLE V
*The Percentage of Institutions Heard from in each
Division*

North Atlantic....	79%	South Central.....	49%
South Atlantic....	62%	Western.....	76%
North Central....	76%		

TABLE VI
*Distribution of the Institutions that require Senior
Finals at the Same Time as for Other Students*

North Atlantic.....	38	South Central.....	22
South Atlantic.....	21	Western.....	18
North Central.....	68	Total.....	167

If we compare Tables II. and VI., it is evident that the two methods of arranging senior finals run rather evenly. The low percentage of returns from the South Atlantic and South Central divisions, as shown in Table V., makes any inference decidedly hazardous. That the ratio in the other divisions would remain about the same, were all the remaining insti-

² This number, 347, represents all the postals returned. Twenty-six of them were too indefinite for use on this first problem. Most of them, however, are usable on the second problem.

tutions heard from, is likely because of the high percentage of replies obtained from those sections. This part of the problem, then, remains rather indeterminate, when the undifferentiated list of institutions is treated in this simple way.

If we turn, now, to the second problem, viz., excusing from examinations, we find that the alignment of the different institutions does not remain the same. About one half of those that schedule the senior finals early also excuse from the finals altogether provided the term work is satisfactory, and somewhat less than a third of the other group follows the same practise. The percentage accepted as satisfactory ranges from 65 per cent. in one case to 95 per cent. in several others. The majority of the institutions which approve this practise make either 85 per cent. or 90 per cent. the sufficient grade. In Table VII. the distribution of these institutions is given.

Table VII. shows that 121 institutions, or slightly more than one third of all that were heard from, are accustomed to excuse seniors from final examinations in the last term or semester upon the basis of their term or semester standing, or altogether as is true in a few cases. Since 70 per cent. of all the institutions in the country responded to the questionnaire, it is likely that the same ratio would be maintained if all reported. It is also very evident from this table that there is a greater tendency to excuse from examinations among the institutions of the North Central section than elsewhere, since about one half of all the institutions of that sort in the country that replied are located in that section, while only 39 per cent. of all the institutions of the country are in that division. Still further, since 76 per cent. of all the institutions of the North Central division responded to the inquiry, it is likely that this high average prevails among the other institutions of this locality that were not heard from. This is a more definite result than that obtained with reference to the first question by the application of this simple method to the data in hand.

Another method of dealing with the data confirms the result just stated, and yields

TABLE VII

Distribution of Institutions that Excuse Seniors from Final Examinations

	North Atlantic						South Atlantic						North Central					
	Less than 85%	85%	90%	More than 90%	Various ⁴	Totals	Less than 85%	85%	90%	More than 90%	Various	Totals	Less than 85%	85%	90%	More than 90%	Various	Totals
Institutions which otherwise require finals at SAME TIME		3	3		3	9			1			1	2	9	9		7	27
Institutions which otherwise require finals ONE WEEK EARLIER		4			5	9	1		2	2	2	7			1	1	4	6
Institutions which otherwise require finals TWO WEEKS EARLIER					1	1		1			2	3	1	2	3	1	4	11
Scattering ³					1	1	1	1	1		2	5	1	5	5		6	17
Totals		7	3		10	20	2	2	4	2	6	16	4	16	18	2	21	61

	South Central						Western						Totals of all Divisions
	Less than 85%	85%	90%	More than 90%	Various	Totals	Less than 85%	85%	90%	More than 90%	Various	Totals	
Institutions which otherwise require finals at SAME TIME		2	1	1		4		1	2	1	1	5	46
Institutions which otherwise require finals ONE WEEK EARLIER					1	1	1			1		2	25
Institutions which otherwise require finals TWO WEEKS EARLIER			2			2		1			1	2	19
Scattering ³		1	2		1	4		1		3		4	31
Totals		3	5	1	2	11	1	2	3	2	5	13	121

rather definite information in connection with the practise of setting senior finals at an early date.

The list of institutions given in the "Report of the Commissioner of Education"³ is complex. If we analyze it and put the state universities in a group by themselves, state colleges by themselves, colleges and universities on private foundations by themselves, and so on, and then get at the annual income of each institution and make corresponding subgroups, much more information is elicited.

It is, of course, not easy to arrange these

³ This term is used to designate those institutions which schedule senior examinations at other dates than just one or two weeks, as indicated on Table I.

⁴ The term "Various" is used to include excusing from examinations at the option of the professor, with or without a definite percentage, and a number of other ways which hardly needed to be presented in detail, while the total of this and 90 per cent. are the preferred satisfactory grades.

⁵ Report for 1909, pp. 900-924.

institutions in income groups. For this purpose, I used the Report of the Commissioner of Education for 1909 and for 1910.⁶ A very elaborate treatment would require a study of each institution through the last ten or twenty years. Even then there would be difficulty in determining what group an institution should be placed in because of the fluctuations of income due to growth or decay, increase or decrease in tuition, and the varying amounts yielded by invested funds. The two reports just referred to, however, seem to furnish sufficient material for the purposes of this investigation.

In determining the group to which an institution belongs, I considered the annual income as made up of "tuition and other fees for educational services," the amount obtained from "productive funds," and the amount gained for "current expenses" from "city, state or national government, or private benefactions." It is true that this represents only

⁶ Report for 1909, pp. 961-977. Report for 1910, pp. 943-961.

rough work, and yet when the same test is applied to each institution for two successive years the results can not be far wrong. Table VIII. gives these results in simple form for those institutions which replied to the ques-

TABLE VIII
Educational Institutions according to Groups

		Examinations Scheduled for Seniors			Totals
		At Same Time as for Other Students	Earlier than for Other Students	Scattering	
Schools of technology.....		4	5	1	15
Agricultural schools.....		1	11	1	23
State universities.....		17	13	3	41
State colleges.....		2	2		5
State schools of mines.....					4
Military and naval institutions...		2			6
Universities and colleges					
\$100,000 or more...		32	14	2	50
\$ 50,000 to \$100,000		19	17	3	45
\$ 25,000 to \$ 50,000		17	32	5	79
\$ 5,000 to \$ 25,000		65	50	10	184
Less than \$5,000 ...		2	1		9
Totals.....		161	145	25	461

tionnaire, arranged according to their attitude to the first question, and the institutions not heard from in a column by themselves. The institutions with no incomes listed in these two reports are of course not entered. This accounts for the discrepancy between the total 461 and the 493 to which postals were sent. These income groups, too, I worked out especially in connection with the colleges and universities upon private foundations, since it is with these that the problem seems to be most acute.

From this table it is evident that a majority of the state universities and of the colleges and universities on private foundations with an annual income of \$100,000 or more, follow the practise of requiring the seniors to take

"Scattering" means that the postals did not indicate clearly whether the examinations for seniors occurred earlier or not.

their final examinations at the same time as the rest of the students. Still further, of all the state universities, only four have an income apparently under \$100,000 a year. One of these belongs among those with senior examinations at the same time as for other students, two among those favoring an earlier date, and one among those not heard from. Combining these results, we get 48 institutions with an annual income of \$100,000 or more favoring examinations for all students at the same time, and 25 favoring an earlier date for senior finals. The practise of these institutions seems to be decidedly in favor of the former. It is of importance, too, to note that all of the colleges and universities in the country on private foundations and belonging to this group were heard from except two.

This table also shows that the practise of having senior finals at an earlier date is almost equal to the other method among the colleges and universities with an annual income of from \$50,000 to \$100,000, and that it reaches a majority of almost two to one among the institutions with an income of from \$25,000 to \$50,000 a year, or 40 per cent. of all the institutions of that class in the country. In the next lower income group, the ratio shifts back into approximate conformity with the highest income groups.

The distribution of these institutions according to the census divisions is rather suggestive in places. We need consider only the state universities and the groups of institutions on private foundations, except the lowest.

TABLE IX
Distribution of State Universities

		North Atlantic	South Atlantic	North Central	South Central	Western	Totals
Final examinations scheduled	For all students at the same time...	2	2	10		3	17
	For seniors earlier...		3	3	3	4	13
	Scattering...				1	2	3
	Institutions not heard from...		1	1	4	2	8
Totals.....		2	6	14	8	11	41

"Scattering" means in Tables IX. to XIII. that the postals were indefinite on this point.

From Table IX. it is evident that in the North Central section where the state universities are most numerous, and each of them has an annual income of more than \$100,000, there are 10 out of 14 that schedule the final examinations for seniors at the same time as for the rest of the students. Tables X. and XA, also, show that in the North Atlantic section where the colleges and universities of the highest income class are most numerous, 18 out of 28 follow the same practise, and 10 out of 12 is the ratio of these same institutions in New England. These institutions are, presumably, especially well equipped and committed to the highest educational ideals. Or to put the matter differently, 17 out of 41, that is, nearly a half of all the state universities in the country, and 32 out of 50, that is, much more than a half of all the colleges and universities of the highest income, set the senior finals at the same time as for the other students. This is certainly significant.

In Table XI. the situation is about evenly balanced, although the general results seem to be more in line with the two preceding tables than out of harmony with them.

If we turn, now, to Table XII., it is evident that about half of all the institutions of this class are in the North Central section, and that slightly more than a half of these set the senior finals at an early date. Or to put the matter differently, about two thirds, 20 out of 32, of all the institutions in the country of this class that reported this practise are in this North Central section.

TABLE X
*Distribution of Colleges and Universities on
Private Foundations with an Annual
Income of \$100,000 or More*

	North Atlantic	South Atlantic	North Central	South Central	Western	Totals
Final examinations } For all students at the same time . . .	18	4	7	1	2	32
} For seniors earlier scheduled	10	1	2	1		14
} Scattering			1		1	2
Institutions not heard from . . .			1	1		2
Totals	28	5	11	3	3	50

TABLE XA
*Special Analysis of the Distribution of Colleges
and Universities on Private Foundations with
an Annual Income of \$100,000 or More
in the North Atlantic Division*

	New England	New York	New Jersey	Penna.	Totals
Final examinations } For all students at the same time	10	6		2	18
} For seniors earlier scheduled	2	2	2	4	10
} Scattering				1	1
Institutions not heard from					
Totals	12	8	2	7	29

TABLE XI
*Distribution of Colleges and Universities on
Private Foundations with an Annual
Income of from \$50,000 to \$100,000*

	North Atlantic	South Atlantic	North Central	South Central	Western	Totals
Final examinations } For all students at the same time . . .	7		8	2	2	19
} For seniors earlier scheduled	7	1	6		3	17
} Scattering	1		1		1	3
Institutions not heard from . . .	3	1	1	1		6
Totals	18	2	16	3	6	45

TABLE XII
*Distribution of Colleges and Universities on
Private Foundations with an Annual
Income of from \$25,000 to \$50,000*

	North Atlantic	South Atlantic	North Central	South Central	Western	Totals
Final examinations } For all students at the same time . . .	4	2	5	4	2	17
} For seniors earlier scheduled	3	6	20	2	1	32
} Scattering		1	4			5
Institutions not heard from . . .	5	5	10	4	1	25
Totals	12	14	39	10	4	79

Table XIII. does not yield quite such distinct results as Table XII. and yet it points in about the same direction. About one half of all the institutions in this class are in the North Central section, and nearly one third of these have the senior finals early. Still further, 29 out of 50, about three fifths of all

the institutions of this class that reported early finals from all parts of the country are in this North Central division.

TABLE XIII

Distribution of Colleges and Universities on Private Foundations with an Annual Income of from \$5,000 to \$25,000

	North Atlantic	South Atlantic	North Central	South Central	Western	Totals
Final examinations scheduled	4	8	36	10	7	65
For all students at the same time . . .	5	10	29	5	1	50
For seniors earlier . . .	1	1	5	2	1	10
Scattering	5	12	21	19	2	59
Institutions not heard from . . .						
Totals	15	31	91	36	11	184

The evidence is not absolutely conclusive and yet it tends to single out the North Cen-

tral section as the home of this practise and among the colleges and universities with an annual income of from \$5,000 to \$50,000.

Turning, now, to the second phase of the entire problem, the results obtained by the first somewhat rough method are reinforced by this more analytical method. Of the 347 institutions heard from, 121, or a little more than one third, excuse seniors from final examinations. Of these, 71 are institutions with an annual income of from \$5,000 to \$50,000. Still further, while but 39 per cent. of all the colleges and universities of the country are in the North Central section, 50 per cent. of all that excuse from examinations are located there, and 70 per cent. of these, or 43 out of 61, are institutions with from \$5,000 to \$50,000 income a year. These results are evident from Table XIV.

TABLE XIV

Distribution of the Institutions which Excuse Seniors from Final Examinations. Most of them Arranged according to Income Groups

	North Atlantic			South Atlantic			North Central			South Central			Western			Totals ¹⁰			Totals
	Final Examinations Scheduled			Final Examinations Scheduled			Final Examinations Scheduled			Final Examinations Scheduled			Final Examinations Scheduled			Final Examinations Scheduled			
	For All Students at Same Time	For Seniors Earlier	Scattering ⁹	For All Students at Same Time	For Seniors Earlier	Scattering	For All Students at Same Time	For Seniors Earlier	Scattering	For All Students at Same Time	For Seniors Earlier	Scattering	For All Students at Same Time	For Seniors Earlier	Scattering	For All Students at Same Time	For Seniors Earlier	Scattering	
Schools of technology					1			1	1								2	1	3
Agricultural schools		2			1			1	1								5	1	6
State universities	1				1		2	1				2	1			3	5	3	11
State colleges		2											1	2			3		3
Universities and colleges on private foundations with an annual income of																			
\$100,000 or more	4	3	1				2		1				2			8	3	2	13
\$ 50,000 to \$100,000		2					3	1	1				1	1		3	4	2	9
\$ 25,000 to \$ 50,000	2	1			3	1	3	6	4	2						7	10	5	22
\$ 5,000 to \$ 25,000	2			1	6	1	16	9	5	2	2	2	2		1	23	17	9	49
Less than \$5,000					1			1	1				1			1	1		2
Not listed							1	1	1							1	1	1	3
Totals	9	10	1	1	13	2	27	20	14	4	4	3	5	4	4	46	51	24	121
Totals	20			16			61			11			13			121			

"Scattering" means that these postals did not indicate the attitude of the institution toward earlier examinations for seniors or at the same time as other students. They did indicate clearly

exemption from examinations under certain conditions.

¹⁰ This is a summary of the respective columns read across the table.

To make this study more complete one would need to show the tendency, that is, whether the custom of setting senior finals at the same time as the finals for other students is increasing, or *vice versa*, and whether excusing seniors from finals is becoming more or less prevalent. The questionnaire did not provide for this aspect of the matter. It was arranged so as to elicit the information sought speedily, and with the least amount of effort on the part of college and university registrars to whom it was sent. This much, however, may be said. Three eastern institutions, each with an income of at least \$175,000 a year, have tried the method of earlier examinations for seniors and have abandoned it. This was learned from other sources. One of the cards, also, indicated that an eastern institution in the \$100,000 income class, which is now following that practise, is seriously considering a change to the method of scheduling the final examinations for all students at the same time.

In regard to excusing from examinations, it may be said that the return postals from two institutions indicated that they are contemplating adopting this method, but both are in the class with an annual income of from \$5,000 to \$25,000, and in the North Central section. Fifteen postals, rather evenly distributed throughout the country, indicated by such expressions as "Never," "All stand examination," "Not excused under any condition," "All must take both mid-year and final examinations," a decided opposition to any such practise.

A few institutions indicated that the difficulty of grading seniors carefully, when their examinations come at the regular time, just before commencement, is met by putting senior subjects, so far as compatible with a rather wide range of electives, early in the examination period, which, it was shown, extends through one or two weeks.

In attempting to state briefly what this study has shown, I may not assume that there is any method that may be regarded as absolutely best. A practise which is generally favored may not be the best. It is the small

group of institutions, or a single institution, which *may* by experiment discover a method superior to one long tried and approved. None the less, the practise of a decided majority of the better equipped institutions, judging from their annual income, is very significant. That majority is 48 to 25, as given on page 182. While not final, their insistence upon scheduling senior examinations at the same time as for other students, and their tendency not to excuse seniors from the second semester or spring term examinations, the majority against being about the same as in the other case, would seem to indicate what is best at present.

GREGORY D. WALCOTT

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WILLIAM MCMURTRIE¹

WILLIAM MCMURTRIE was born on March 10, 1851, on a farm near Belvidere, N. J. He was an active, energetic lad at school and at Lafayette College, where he entered in the mining engineering course in 1868, graduating in 1871. While in college he was a member of the Franklin Literary Society and of the Zeta Psi fraternity. Among his classmates were the late John Meigs, proprietor of the famous Hill School of Pottstown; Dr. W. B. Owen, a well-known and influential member of the faculty of Lafayette College; D. B. King, of New York City, and H. P. Glover, of Mifflinburg, Pa.

In 1872 McMurtrie became assistant chemist in the U. S. Department of Agriculture at Washington, D. C., Dr. R. J. Brown being the chief chemist. Dr. Wiley says:

¹ Several biographical notices of Dr. McMurtrie have already appeared—one by Dr. C. P. McKenna in *The Percolator*, issued regularly by the Chemists' Club of New York City (June 20, 1913), a more extended notice by Dr. H. W. Wiley in the *Journal of Industrial and Engineering Chemistry* (July, 1913, p. 616). The last named contains a bibliography by Douglas C. McMurtrie. I have drawn upon both these sources. The dates are from Dr. Stonecipher's "Bibliographical Catalogue of Lafayette College" and from "Who's Who in America."